CLAIMS:

1. A data transmission apparatus of an orthogonal frequency division multiplex (OFDM) system comprising:

a transmitter for transmitting therefrom an OFDM signal; and

a receiver for receiving the OFDM signal,

said receiver including:

a correlation arithmetic operation unit for carrying out an arithmetic operation of the correlation between the OFDM signal containing therein at least one of a principle wave and a reflected wave which have been received and a predetermined synchronous symbol signal;

an effective correlation position detection unit for analyzing a cross-correlation value sequence signal from said correlation arithmetic operation unit to detect, out of at least one or more correlation peaks, an effective correlation peak in which the inter-symbol interference becomes minimum; and

a circuit device for on the basis of the effective correlation peak thus detected, carrying out the synchronization of a reception sampling clock of said receiver, and the control for the frame timing and the symbol timing thereof.

2. A data transmission apparatus according to claim 1, wherein said receiver further includes a

control state protection unit for, when the effective correlation peak can not be detected in said effective correlation position detection unit, suspending the control in said circuit device to hold the control state right before the suspension.

3. A data transmission apparatus according to claim 1, wherein said receiver further includes a synchronous control circuitry for, on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

4. A data transmission apparatus according to claim 3, wherein said synchronous control circuitry includes: a frame counter for counting the frame timing with the sampling clock on the transmission side using the received OFDM signal; a position correction circuit for calculating the frame timing with the sampling clock on the reception side using, as a reference, the position of the effective correlation peak on the time base to output an error between the frame timing thus calculated and the frame timing acquired in said frame counter; and a voltage-controlled oscillator an oscillation frequency signal of which is controlled by said position correction circuit to generate the sampling clock on the reception side, wherein the control is carried out such that the frequency of the reception side sampling clock is synchronized with the

frequency of the sampling clock on the transmission side.

5. A data transmission apparatus according to claim 1, wherein said effective correlation position detection unit includes a circuit for judging whether or not each of the at least one or more correlation peaks is equal to or larger than a predetermined value to detect, out of the correlation peaks each having the value equal to or larger than the predetermined value, the effective correlation peak in which the inter-symbol interference becomes minimum.

6. A data transmission apparatus according to claim 1, wherein said effective correlation position detection unit detects the effective correlation peak in which the inter-symbol interference becomes minimum on the basis of the relation between the level difference (D/U ratio) between the principle wave and the reflected wave, and the delay time of the reflected wave relative to the principle wave.

7. A data transmission apparatus according to claim 1, wherein said receiver further includes an FFT arithmetic operation unit, and the position of an FFT time window of said FFT arithmetic operation unit is set on the basis of the effective correlation peak.

8. A data transmission apparatus of an orthogonal frequency division multiplex (OFDM) comprising:

a transmitter for transmitting therefrom an OFDM signal; and

a receiver for receiving the OFDM signal, said receiver including:

a correlation arithmetic operation unit for carrying out an arithmetic operation of the correlation between the OFDM signal containing therein at least one of a principle wave and a reflected wave which have been received and a predetermined synchronous symbol signal;

an effective correlation position detection unit for detecting the effective correlation peak brought by the principle wave out of at least one or more correlation peaks which are contained in a cross-correlation value sequence signal from said correlation arithmetic operation unit; and

a circuitry for, on the basis of the effective correlation peak thus detected, carrying out the synchronization of a reception sampling clock of said receiver, and the control for the frame timing and the symbol timing thereof.

9. A data transmission apparatus according to claim 8, wherein said receiver further includes a control state protection unit for, when the effective correlation peak can not be detected in said effective correlation position detection unit, suspending the control in said circuit device to hold the control state right before the suspension.

10. A data transmission apparatus according to claim 8, wherein said receiver further includes a

synchronous control circuitry for, on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

11. A data transmission apparatus according to claim 10, wherein said synchronous control circuitry includes: a frame counter for counting the frame timing with the sampling clock on the transmission side using the received OFDM signal; a position correction circuit for calculating the frame timing with the sampling clock on the reception side using, as a reference, the position of the effective correlation peak on the time base to output an error between the frame timing thus calculated and the frame timing acquired in said frame counter; and a voltage-controlled oscillator an oscillation frequency signal of which is controlled by said position correction circuit to generate the sampling clock on the reception side, wherein the control is carried out such that the frequency of the reception side sampling clock is synchronized with the frequency of the sampling clock on the transmission side.

12. A data transmission apparatus according to claim 8, wherein said effective correlation position detection unit detects the effective correlation peak brought by the principle wave on the basis of the time relation between the principle wave and the reflected

wave.

13. A data transmission apparatus according to claim 8, wherein said receiver further includes an FFT arithmetic operation unit, and the position of an FFT time window of said FFT arithmetic operation unit is set on the basis of the effective correlation peak.

14. A receiver for use in a data transmission apparatus of an orthogonal frequency division multiplex (OFDM) system, for receiving an OFDM signal comprising:

a correlation arithmetic operation unit for carrying out an arithmetic operation of the correlation between the OFDM signal containing therein at least one of a principle wave and a reflected wave which have been received and a predetermined synchronous symbol signal;

an effective correlation position detection unit for analyzing a cross-correlation value sequence signal from said correlation arithmetic operation unit to detect, out of at least one or more correlation peaks, an effective correlation peak in which the inter-symbol interference becomes minimum; and

a circuitry for, on the basis of the effective correlation peak thus detected, carrying out the synchronization of a reception sampling clock of said receiver, and the control for the frame timing and the symbol timing thereof.

15. A data transmission apparatus according to claim 14, further comprising a control state protection

unit for, when the effective correlation peak can not be detected in said effective correlation position detection unit, suspending the control in said circuit device to hold the control state right before the suspension.

16. A data transmission apparatus according to claim 14, further comprising a synchronous control circuitry for on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

17. A data transmission apparatus according to claim 16, wherein said synchronous control circuitry includes: a frame counter for counting the frame timing with the sampling clock on the transmission side using the received OFDM signal; a position correction circuit for calculating the frame timing with the sampling clock on the reception side using, as a reference, the position of the effective correlation peak on the time base to output an error between the frame timing thus calculated and the frame timing acquired in said frame counter; and a voltage-controlled oscillator an oscillation frequency signal of which is controlled by said position correction circuit to generate the sampling clock on the reception side, wherein the control is carried out such that the frequency of the reception side sampling clock is synchronized with the frequency of the sampling clock on the transmission

side.

18. A data transmission apparatus according to claim 14, wherein said effective correlation position detection unit includes a circuit for judging whether or not each of the at least one or more correlation peaks is equal to or larger than a predetermined value to detect, out of the correlation peaks each having the value equal to or larger than the predetermined value, the effective correlation peak in which the inter-symbol interference becomes minimum.

19. A data transmission apparatus according to claim 14, wherein said effective correlation position detection unit detects the effective correlation peak in which the inter-symbol interference becomes minimum on the basis of the relation between the level difference (D/U ratio) between the principle wave and the reflected wave, and the delay time of the reflected wave relative to the principle wave.

20. A data transmission apparatus according to claim 14, further comprising an FFT arithmetic operation unit, and the position of an FFT time window of said FFT arithmetic operation unit is set on the basis of the effective correlation peak.

21. A receiver for use in a data transmission apparatus of an orthogonal frequency division multiplex (OFDM) system, for receiving an OFDM signal comprising:

a correlation arithmetic operation unit for carrying out an arithmetic operation of the correlation

between the OFDM signal containing therein at least one of a principle wave and a reflected wave received and a predetermined synchronous symbol signal;

an effective correlation position detection unit for detecting the effective correlation peak brought by the principle wave out of at least one or more correlation peaks which are contained in a cross-correlation value sequence signal from said correlation arithmetic operation unit; and

a circuit device for, on the basis of the effective correlation peak thus detected, carrying out the synchronization of a reception sampling clock of said receiver, and the control for the frame timing and the symbol timing thereof.

22. A data transmission apparatus according to claim 21, further comprising a control state protection unit for when the effective correlation peak can not be detected in said effective correlation position detection unit, suspending the control in said circuit device to hold the control state right before the suspension.

23. A data transmission apparatus according to claim 21, further comprising a synchronous control circuitry for, on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

24. A data transmission apparatus according to

claim 23, wherein said synchronous control circuitry includes: a frame counter for counting the frame timing with the sampling clock on the transmission side using the received OFDM signal; a position correction circuit for calculating the frame timing with the sampling clock on the reception side using, as a reference, the position of the effective correlation peak on the time base to output an error between the frame timing thus calculated and the frame timing acquired in said frame counter; and a voltage-controlled oscillator an oscillation frequency signal of which is controlled by said position correction circuit to generate the sampling clock on the reception side, wherein the control is carried out such that the frequency of the reception side sampling clock is synchronized with the frequency of the sampling clock on the transmission side.

25. A data transmission apparatus according to claim 21, wherein said effective correlation position detection unit detects the effective correlation peak brought by the principle wave on the basis of the time relation between the principle wave and the reflected wave.

26. A reception method of receiving an OFDM signal for use in a data transmission apparatus of an orthogonal frequency division multiplex (OFDM) system, comprising the steps of:

carrying out an arithmetic operation of the

correlation between the OFDM signal containing therein at least one of a principle wave and a reflected wave received and a predetermined synchronous symbol signal;

analyzing a cross-correlation value sequence signal acquired from said correlation arithmetic operation to detect, out of at least one or more correlation peaks, an effective correlation peak in which the inter-symbol interference becomes minimum; and

on the basis of the effective correlation peak thus detected, carrying out the synchronization of a reception sampling clock of said reception method, and the control for the frame timing and the symbol timing thereof.

27. A reception method according to claim 26, further comprising the step of, when the effective correlation peak can not be detected, suspending the synchronization of the reception sampling clock, and the control for the frame timing and the symbol timing to hold the control state right before the suspension.

28. A reception method according to claim 26, further comprising the step of on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

29. A reception method according to claim 26, wherein said step of detecting the effective correla-

tion peak includes the step of judging whether or not each of the at least one or more correlation peaks is equal to or larger than a predetermined value to detect, out of the correlation peaks each having the value equal to or larger than the predetermined value, the effective correlation peak in which the inter-symbol interference becomes minimum.

30. A reception method according to claim 26, wherein in said step of detecting the effective correlation peak, an effective correlation peak is detected in which the inter-symbol interference becomes minimum on the basis of the relation between the level difference (D/U ratio) between the principle wave and the reflected wave, and the delay time of the reflected wave (with respect to the principle wave).

31. A reception method according to claim 26, further comprising the step of on the basis of the effective correlation peak, setting the position of an FFT time window of said FFT arithmetic operation step.

32. A reception method of receiving an OFDM signal for use in a data transmission apparatus of an orthogonal frequency division multiplex (OFDM), comprising the steps of:

carrying out the arithmetic operation of the correlation between the OFDM signal containing therein at least one of a principle wave and a reflected wave received and a predetermined synchronous symbol signal;

detecting the effective correlation peak

brought by the principle wave out of at least one or more correlation peaks which are contained in a cross-correlation value sequence signal acquired from said correlation arithmetic operation; and

on the basis of the effective correlation peak thus detected, carrying out the reception sampling clock synchronous processing, and the control for the frame timing and the symbol timing of said reception method.

33. A reception method according to claim 32, further comprising the step of, when the effective correlation peak can not be detected in said step of detecting the effective correlation peak, suspending the reception sampling clock synchronous processing, and the control for the frame timing and the symbol timing of said reception method to hold the control state right before the suspension.

34. A reception method according to claim 32, further comprising the step of, on the basis of the effective correlation peak, carrying out the control such that the reception sampling clock frequency is synchronized with a sampling clock on the transmission side.

35. A reception method according to claim 32, wherein in said step of detecting the effective correlation peak, the effective correlation peak brought by the principle wave is detected on the basis of a time relation between the principle wave and the

reflected wave.

36. A reception method according to claim 32, further comprising the step of, on the basis of the effective correlation peak, setting the position of an FFT time window of said FFT arithmetic operation step.